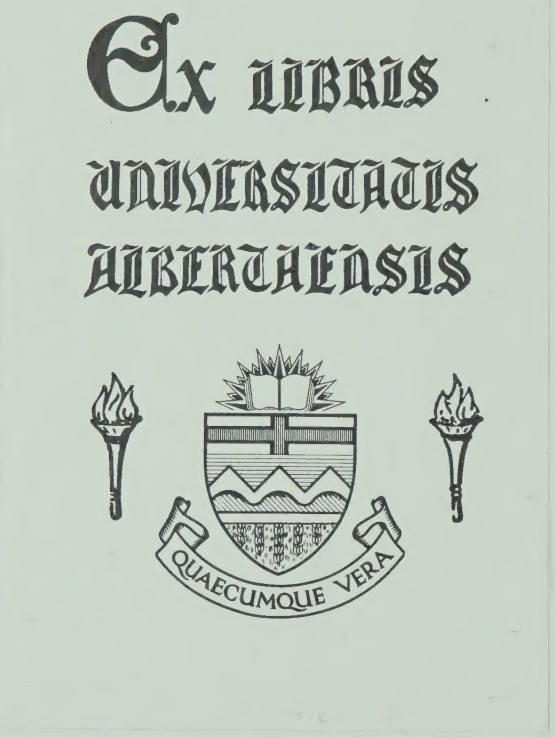

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A COMPARISON OF THE FREE RECALL PERFORMANCE OF SCHIZOPHRENIC AND NONPSYCHOTIC SUBJECTS

by

© RICHARD CLARK KIMMIS

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE

OF MASTER OF ARTS

DEPARTMENT OF PSYCHOLOGY

EDMONTON, ALBERTA

FALL, 1969

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "A Comparison of the Free Recall Performance of Schizophrenic and Nonpsychotic Subjects" submitted by Richard Clark Kimmis in partial fulfilment of the requirements for the degree of Master of Arts.

ABSTRACT

In this experiment the verbal recall and organizational abilities of schizophrenic and nonpsychotic Ss were examined. Organization during free recall was inferred from the sequential ordering or grouping of the input material.

An attempt was made to equate the diagnostic groups on age, education, sex, verbal IQ, and drug usage. Initially all Ss were given a continuous, free word association test. Partly on the basis of their word association test responses, two 18-item lists were constructed for each S. That is, from each S's own associations three word clusters containing three words each were selected and combined along with nine other filler or buffer words, chosen by the E, to form lists. Then, these tailor-made lists were presented for free recall.

With this procedure it was possible to estimate the strength of associative clusters for each S. In brief, the "strong" list contained associations that occurred earlier in associative production than those in the "weak" list.

In general, it was found that schizophrenics recalled fewer words, and that their responses were not as organized as those of nonpsychotic subjects. However, their responses were not totally disorganized. In addition the deficit performance of schizophrenic Ss was accentuated on the "weak" list. The above findings must be cautiously interpreted, because the controls of this experiment were only minimally effective. Therefore, factors other than the experimental manipulations could have affected the results.

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CHAPTER I

INTRODUCTION

This research was conceived and executed in the hope that it would provide some information about the higher order mediational processes of schizophrenics. Specifically, this investigation focused on the verbal organizational abilities of schizophrenic and nonpsychotic, hospitalized, neuropsychiatric patients during a free recall task.

The bizarre and sometimes colorful aspects of schizophrenic language and thought have been highly publicized. Clang and indirect associations, the tendency toward stereotypy, the condensation of two ideas into a single one, and blocking are some of the deviant verbal behaviors observed in schizophrenic speech. Language and thought disturbances are apparent in many schizophrenics. For example, a patient of Bleuler's defined "hay" as a means of maintenance of a cow (Bleuler, 1950, p. 20). After a table was removed from another patient's room, he remarked, "Farewell, I am Christ" (Bleuler, 1950, p. 19). In these situations, the patient captures something of the situation. In 1915 Freud poetically described this "something" as the schizophrenic's only partially successful attempt to capture reality and, instead of recapturing lost object representations or reality, the schizophrenic merely succeeds in recapturing their shadows (Freud, 1960). Put another way, the schizophrenic's associations are imprecise approximations which are generally about the subject (Cameron, 1946).

Behaviorally, neurotics, schizophrenics and other psychotics ex-

hibit many of the same symptoms. Then, the key question is, what are the symptoms which differentiate schizophrenia from the other psychiatric diagnostic categories? In general, most authors seem to agree that schizophrenia involves some form of extreme thought disorganization. White (1964) describes schizophrenia as a "breakdown in the very structure of thinking" (p. 523). Historically, psychic disorganization is reflected in the origin of the name of the disease. In 1911, Eugen Bleuler, who modified the old Kraepelian diagnosis of dementia praecox and renamed it schizophrenia, proposed that in every sense of this disease there is "more or less" a splitting of psychic functions (Bleuler, 1950). In the more recent literature, the importance of thought disorganization was stressed by Maher (1966). He observed that the presence of bizarre and disordered thinking evokes the diagnosis of schizophrenia more readily than almost any other symptom.

Since a great deal is known about the performance of normal Ss, most studies within psychopathology compare one or two abnormal groups with a normal one. In this area research techniques and theoretical formulations developed on normals, are used as a basis for evaluating the performances of the abnormal populations. Essentially, the present study is within this tradition; i.e., it has its empirical and theoretical roots in work on normal organizational processes.

Miller (1956) was one of the first to suggest that memory is hierarchically organized. Essentially, he proposed that the immediate memory span is limited to 7 ± 2 "chunks" of information. Through a process of recoding or reorganizing, it is possible to increase the

number of "bits" of information within each "chunk." Therefore, input material which exceeds the 7 ± 2 limit can be effectively handled.

Miller's hypothesis has stimulated considerable work on the organization of memory as reflected in free recall clustering. In the free recall experiment, the S is usually presented with a list of words, one at a time. After all the words have been presented, the S is asked to recall them in any order. Since the output of the S is not determined by the E as it is in serial and paired associates learning paradigms, output orders which show systematic consistencies (groupings) provide evidence for subject-imposed organization (Tulving, 1968). Here it is assumed that the recall order reflects the order in which the words occur to the S (Runquist, 1968).

Free recall organization is a widely studied, well documented phenomenon. Evidence for subject-imposed grouping has been obtained from associatively and categorically related word lists, and from input that was presumably unrelated. In general, it has been shown that as organization increases, learning also increases. Organization could be responsible for learning; however, it should be noted that alternative explanations exist (Tulving, 1968).

The present investigation viewed the organizational processes of schizophrenic and nonpsychotic Ss from two perspectives. Firstly, is the schizophrenic intrinsically disorganized, or is organization in schizophrenia simply different from that in the normal mind (Deese, 1965)? It seems possible that the associations of schizophrenics could be highly organized but nevertheless bizarre and unusual. Secondly, the associative-organizational processes of schizophrenics

were analyzed from the point of view of the structure-process distinction; that is, with content (which in part reflects structure) held relatively constant across Ss, will schizophrenics, as compared to nonpsychotic Ss, exhibit process differences?

Psychological structure and process are inferred from overt behavior. For example, surface associations elicited during the word association test are presumed to be indicators of an underlying structural arrangement or relatively stable patterns among words. That is, from the surface patterns of associations deeper structural connections are inferred (Pollio, 1968). Process, on the other hand, refers to the S's efficiency at a particular time. Organization processes during free recall occur between input and output as the S rearranges or groups the material. Thus, psychological, verbal structure delineates the relationships among verbal components. Process, on the other hand, refers to an ongoing activity of the organism in relation to those components at a given time and under a given set of conditions.

Organization during free recall may be the product of structural organization, for structure in material is seen as facilitating recall (Pollio, 1968). Let us suppose that response clusters to different stimulus words, taken from a S's own word association test responses are combined randomly into a stimulus list and presented for several trials to the same S for free recall. Let us further assume that there is no associative overlap between these clusters. Then, to the extent that the S's associations to the word association test items reflect deeper preestablished patterns of associations, the words within each associatively related cluster should tend to be grouped

together by the S during free recall. When viewed from this perspective, free recall is not a process of establishing new bonds, but one of strengthening the associative structure itself (Pollio, 1968).

Essentially, the procedure just outlined was used in the present study. That is, each S's own WAT responses were systematically incorporated into lists and presented to the S for free recall. With this procedure it is possible to assess, in part, the structural relationships within the associatively related word clusters for each S. Then, in each group, Ss are tested to see how they utilize; i.e., process, their own associations.

CHAPTER II

EMPIRICAL CONSIDERATIONS

Some of the earliest studies in psychology attempted to isolate various aspects of schizophrenic speech and thought. Since these early investigations, there has developed a large area within psychopathology which utilizes the techniques of the modern learning laboratory to investigate these phenomena.

In this chapter experiments focusing on organization, association, learning, and communication will be summarized. The empirical literature in these areas is extremely fragmented and systematic investigations have been infrequent. Moreover, methodological problems have limited the generality of findings, and seem to be the major cause of inconsistency. As a result, organization of this material is difficult, and any conclusions must be tentatively stated.

Methodological problems have also hampered theoretical development. Most of the studies pertaining to learning and verbal behavior in schizophrenia were designed to test molar, clinical theories, like those of Bleuler (1950) and Freud (1960). Such theories and their extensions have dominated the empirical literature for the last half-century, and only in the past decade or so have important micro-theories of schizophrenia emerged. The structure-process distinction has grown out of the micro-theoretical approach. Thus it provides a limited, empirically-oriented framework within which schizophrenic behavior can be examined. As a result, many of the studies reviewed here are not directly pertinent to that framework and this investigation per se, but simply provide a basis for evaluating

the relevancy of this work.

Word Association Test

The word association test (WAT) is an empirical method of studying psychological processes. The WAT is presented in either a discrete or continuous form. The discrete form requires the S to produce a single association to a stimulus word, while the continuous form requires the production of more than one association. In addition, the format of the test may be either free or controlled. In the free association test an attempt is made to tap associations in their most unconstrained form and so the response(s) choice is left up to the S. On the other hand, in the controlled association test, the S's response is restricted by the E. The multiple-choice questionnaire is an example of such a restricted situation. The free association test has been employed more extensively than the controlled form in the study of mental structure and organizational processes, because it is perhaps the best of the available psychological techniques for eliciting context-free responses (Deese, 1965).

The following section is concerned with a discussion of the various factors related to schizophrenic verbal thought processes which have been investigated with the WAT. These include uncommon associations, chronicity and good-poor premorbid adjustment, instructional set, idiodynamic set, stability, and electroshock and chemotherapy.

Uncommon associations. Moran (1953) found that the free associations of paranoid chronic schizophrenics showed a less meaningful relation to the stimulus word than those of normal Ss. Despite this difference, there was a large overlap between the distributions of the

two groups. These findings would seem to preclude the use of the WAT as a diagnostic instrument.

In a similar study, Johnson, Weis, and Zelhart (1964) had a group of hospitalized psychotics and brain damaged Ss and a second group of normal Ss rate words using an Osgood, Suci, and Tannenbaum (1957) scale (very good-very bad). Ss were then asked to produce as many associations as they could to those words within a one minute period: this is Noble's (1952) measure of meaningfulness (m). The ratings of normals as compared with those of neuropsychiatric patients showed a significant shift toward the "good" end of the continuum. The normal group also produced higher m values, a higher percentage of nonidiosyncratic responses (based on WAT norms), and had the highest percentage of Ss making the most common first association to each stimulus word. On the other hand, as in the Moran (1953) study, there was a substantial core of similarity in the response patterns of the two groups, and the correlations between the groups on the above measures were in the .70s and .80s. This degree of similarity occurred despite wide differences in sex, educational background, and socioeconomic class between the patients and the college student controls. Thus, it appears that although schizophrenics as a group give more unusual or uncommon responses to the WAT than normal Ss, the substantial core of similarity in the response patterns of these two groups suggests that the associative hierarchies of schizophrenics and normals are not radically different.

Chronicity and good-poor premorbid adjustment. Several studies have compared the WAT responses of chronic and acute patients. Using

the standard free association test and the "most people" form, Wynne (1963) found that long-term, relative to short-term schizophrenic patients, gave fewer primary responses and more unusual responses. Primary responses were taken from the Russell and Jenkins (1954) norms, and at least 25 per cent of the normative sample gave a primary response to each item. The words which fell outside of those given by 90 per cent of the normative sample were classified as "unusual responses."

Further evidence for increasing associative disturbance with increasing chronicity comes from Higgins, Mednick, and Philip (1965). They rated the performance of schizophrenics relative to the Palermo and Jenkins (1964) norms on the following indices: (a) "overall" measure--the frequency with which schizophrenic responses were given by the normative sample; (b) "most common" measure--the number of the Ss' responses given most frequently by the Palermo-Jenkins Ss; and, (c) "least common" measure--the number of schizophrenic responses which did not appear in the norms. The means so obtained were found to be significantly correlated with hospitalization (-.42, -.40, and +.45, respectively).

In a study by Dokecki, Polidoro, and Cromwell (1965), the commonality scores of poor premorbid schizophrenic Ss, or those having long-term adjustmental difficulties, were significantly inferior to tuberculosis patients. In comparison, the commonality scores of good premorbid Ss, or patients with a relatively good adjustmental history, were essentially similar to those in the tuberculosis group. Commonality scores were based on normative frequency (Horton, Marlowe, and

Crowne, (1963). That is, a response that appeared frequently in the sample was given a higher commonality score than one that occurred less frequently.

In another study, Ries and Johnson (1967) reported, after comparing the commonality scores of good and poor premorbid schizophrenics, that differences between the two groups emerged only after five years of hospitalization. Theoretically, good premorbid Ss should be hospitalized for only relatively short periods of time; therefore, Ries' and Johnson's long-term, good premorbid Ss may well represent an unusual sample.

In an effort to clarify the relationship between chronicity and premorbid adjustment, Higgins (1968) and Dokecki, Cromwell, and Polidoro (1968) reanalyzed data from previous studies (Dokecki et al., 1965; Higgins et al., 1965; Higgins, Mednick, Philip, and Thompson, 1966). Higgins (1968) reported that his data indicated that associative commonality is more strongly related to chronicity than to premorbid adjustment. But Dokecki et al. (1968) found the reverse to be true; that is, premorbid adjustment was significantly related to commonality, while the chronicity dimension was not. In brief, there appears to be no clear-cut relationship between length of hospitalization, the patient's prior adjustment, and his performance on the word association test.

Instructional set. Wild (1965) presented schizophrenic and normal Ss with the standard free associative test. This was followed by descriptions of regulated (conventional) and unregulated (unconventional) social types. After each description, Ss were asked to

produce associations like those that each social type would give. In both treatment conditions, schizophrenics showed less change than normal Ss from one social type to another.

In Wynne's (1964) study, groups of normals, chronic and acute schizophrenics were presented with 100 items from the Kent-Rosanoff list under three instructional sets. Initially they were asked to produce a single "free" association to the stimulus word. Then, they were presented with the same material and asked to give the response they felt "most people" would give. In the final test, normals and acute schizophrenics were given a multiple-choice form of the "most people" association task. Across all three tests, normals gave more popular associations (based on normative frequency) than did acute patients, and on the two tests presented to all three groups, the following relationships held for the total number of popular responses: normals > acute > chronics.

In spite of these differences, Wynne emphasized the commonality in the response patterns among the groups. He proposed that the association hierarchies of schizophrenics and normals are not essentially different; therefore, the word association norms based on the responses of normal Ss are suitable for evaluating the association responses of schizophrenics.

Somer, Dewar, and Osmond (1960) reported that the WAT responses of schizophrenics, relative to normal Ss, were more unstable and uncommon. However, on a rating task which required Ss to rate their own associations on a continuum from very common to very private, there were no differences between the scores of schizophrenic, nonpsychotic

psychiatric patients, and normals. In fact, on this task the judgement of schizophrenic patients, as compared to nonpsychotic patients, was superior. In sum, it appears that instructional set influences the performance of schizophrenics under some conditions but not under others. It also appears that schizophrenics may have insight into the commonness or uncommonness of their own associations, even though it seems they are unable to use this knowledge in the production of association sequences. Such insight may reflect the substantial core of similarity between the association hierarchies of schizophrenics and normals.

Stability. Studies by Somer et al. (1960) and Storms and Broen (1964) have found the test-retest association responses of schizophrenics to be more unstable than those of normals. Dokecki et al. (1965) have presented evidence which suggests that not all schizophrenics exhibit associative instability. That is, the stability scores of their good premorbid Ss were not different from those of tuberculosis patients.

Idiodynamic set. On four successive days, Moran, Medford, and Kimble (1964) presented 25-item lists under standard free association test instructions to a matched group of normals and schizophrenics. In general, schizophrenic, relative to normal Ss, scored lower on six variables designed to measure individual differences in association structure (e.g., "synonym"--a word that has the same meaning as the stimulus word) and higher on mediation fault variables (e.g., "distant"--a response word that does not appear to have any relationship to the stimulus word).

Despite the differences between them, factor analysis revealed that the same "idiodynamic sets" appeared to be operating in both groups. Normal Ss consistently exhibited the same set throughout all four days of testing. The sets of schizophrenic Ss also remained operative throughout the sessions, even though they were weaker after day one. The authors concluded that, to the degree that idiodynamic sets represent associative structure, these two groups seem to share a common hierarchy.

Electroshock and chemotherapy. Moran et al. (1964) report an earlier 1960 study in which they presented 30 alternative forms of a 20-item WAT to a single schizophrenic S. Thus, on every thirty-first day the S responded to a list of words he had taken one month before. During months five and six, the patient received electroshock treatment (EST) and chemotherapy. Following cessation of EST, the S's clinical condition improved and the number of new associations rose from an average of 38 per cent to 64 per cent. This increase was accompanied by a "marked" increase in commonality scores. However, during month eight, the S's condition declined accompanied by an encroachment of old associations and lower commonality scores. According to the authors, the normal-like association structures of this S were latent and emerged temporarily following treatment.

Summary. In brief, the above experiments on the associative processes indicate the following:

1. Schizophrenics tend to produce uncommon associations; however, the associative repertoires of schizophrenic and normal Ss exhibit a substantial core of similarity.

2. The relationship between premorbid adjustment and WAT commonality scores is ambiguous. However, distinctions of this type have been useful in pointing out intra-group differences among schizophrenic Ss.

3. Schizophrenics exhibit a deficit performance when asked to change their response set even though they appear to have insight into the commonness-uncommonness of their own associations.

4. The WAT responses of some schizophrenics appear to be more unstable than those of normal Ss.

5. Associative production of a schizophrenic patient was sensitive to EST and chemotherapy.

6. There is considerable evidence to recommend looking at associative behavior from the structure-process distinction.

Paired-Associates Learning

Most of the investigations of learning in schizophrenia have used the paired-associates paradigm, in which lists consist of pairs of items. The S is required to learn each of the pairs. For example, in the common "anticipation" method, the S must learn to anticipate the second member of each pair when the first one appears.

Spence and Lair (1964) presented paired-associates lists derived from the Russell and Jenkins (1954) WAT norms to acute schizophrenic and nonpsychiatric patients. List I, initially given to all Ss, was constructed so that stimulus and response terms had only a minimal amount of formal and meaningful similarity between them. Following presentation of List I, half of the Ss in each group were given either a control or an experimental list to learn. In the experimental list,

each stimulus-response pair had virtually no connection with each other, but each stimulus had a strong association to another response term in the list. The control list contained the same response terms as the experimental list; however, its stimulus terms had only a minimal connection with the response terms. On the crucial experimental list, schizophrenics gave more correct responses than normals, but they took significantly more trials to reach criterion on the control list. Schizophrenics also gave more extralist responses than their normal counterparts; however, their errors on List I were not related to the WAT norms.

Using the same material and experimental design, Spence and Lair (1965) compared the performance of chronic remitted (relatively symptom free) and nonremitted (actively psychotic) schizophrenic patients. The learning scores of remitted Ss were superior to those of the nonremitted group on List I. With respect to the error scores, there was no difference in the proportion of overt errors between the groups, but nonremitted Ss gave more extralist responses. Although these responses were not related to the WAT norms, a comparison of the learning scores of the Ss who gave more extralist responses with the scores of those who did not, shows that the former were not more susceptible to associative interference. It is evident that the authors found no strong evidence for a broad associative disturbance in schizophrenics.

Lang and Luoto (1962) modified the standard paired-associates paradigm. They employed two paired-associates lists, and within each list a nonsense syllable stimulus term was paired with a response word. Each S's own unique associations to List I response terms,

elicited on a prior word association test, were used as List II response terms. However, only half of them were paired with their appropriate stimulus (mediated pairs); the remainder of the List II response terms were randomly assigned to stimulus terms (nonmediated pairs).

There were no significant differences between the performance of anxiety reactive, schizophrenic, and normal Ss on the mediated pairs. On non-mediated pairs, however, schizophrenics' scores were lower than those of normal Ss. Schizophrenics also took more trials on List II to reach criterion than the other two groups, and were more susceptible to the intrusion of List I response terms during the learning of List II. On the basis of the above findings, the authors conclude "that special transfer and interference phenomena are important contributors to the symptom picture in chronic schizophrenia" (p. 119).

The above empirical work on the paired-associates learning paradigm indicates that:

1. Schizophrenics do learn.

2. Schizophrenics show a learning deficit on some tasks, but not on others. Furthermore, there is no clear-cut relationship between the learning deficit and associative processes.

3. When their own responses were used, schizophrenics did not exhibit a learning deficit for these items.

Related Studies

Mediation with weaker material. Chapman, Chapman, and Miller (1964) propose that the errors made by schizophrenic Ss in experimental settings represent the attenuated expression of a normal response

bias. They go on to suggest that this tendency is related to an inability on the part of schizophrenic Ss to mediate with the weaker meaning responses, and a corresponding over-reliance on the stronger meaning ones, regardless of their appropriateness.

The Chapman et al. (1964) hypothesis has received considerable empirical support. For example, Deckner and Blanton (1969) used a modified paired-associates task to investigate the effects of strong and weak associations on the learning of good and poor premorbid schizophrenics and normals. In their experiment Ss were presented with two-card sequences. On the first card was the stimulus word (e.g., needle); while on the second card there were two words, one strong association (e.g., thread), and one weak association (e.g., nail). If the S guessed the word on the second card correctly, he was given a nickel. For half of each group the nickel word was the strong association, and for the other half groups, the reward was given for selecting the weak association. It was found that there were no group differences when Ss were reinforced for responding to the strong association; however, group differences occurred when weak associations were reinforced. That is, the good-poor premorbid groups did not differ from each other, but together they performed more poorly than the normal group on the weaker material. In sum, the findings of this experiment provide a broader base of support for the hypothesis of the Chapman group.

Communication. Cohen and Camhi (1967) utilized Rosenberg and Cohen's (1966) word communication model to study speaker-listener role differences in schizophrenic and normal Ss. Essentially, their task

involved presenting the S with word pairs. One of these words is designated as the speaker's referent word. The speaker's task is to produce a word that will distinguish the referent from the other word. For example, if the words "car" and "automobile" are presented with "car" designated as the referent word, a good response would be "railroad" or "sports," as contrasted with a poorer response, such as "wheels," "Chevy," and so on. In the listener situation, the S is given a word pair and the speaker's response. His task is to guess which member of the stimulus pair was designated as the speaker's referent word.

The author found that schizophrenic speakers produced less accurate clue words than their normal counterparts, and that this difference occurred regardless of the listener's diagnosis. In contrast, there were no differences between these groups in their ability to perform as listeners.

Cohen and Camhi conclude that with their task, a listener with nonidiosyncratic associations, or ones similar to those of the speaker, should be more likely to make an accurate choice of the speaker's referent word. Since no difference was found between schizophrenic and normal Ss on the listener task, it was suggested that the two groups had similar associative repertoires. Speaker differences were attributed to some type of faulty selection mechanism.

Free Recall

Two important studies have used the free recall paradigm to investigate learning and organization in schizophrenia. Bauman and Murray (1968) compared the recognition and recall learning of schizo-

phrenic and normal Ss. Only on the recall task was the performance of normal Ss better. It was suggested that this task made more associative-organizational demands on the S than the recognition task, and that the schizophrenic deficit may be reflected in the organization of free recall material.

In a direct test of this hypothesis, Lauro (1962) presented schizophrenic and normal Ss with "easy" and "difficult" lists constructed from the categorical norms. Essentially, he found a significantly higher degree of clustering for normal Ss only on the "difficult" list. In addition, within the schizophrenic group there was no evidence of idiosyncratic clustering. Lauro (1962) proposed that associative clustering might reveal the more "primitive" type of organization used by schizophrenics. In sum, the organizational capacity in schizophrenia may be impaired. To the extent that organization is responsible for learning, this mediational deficit could account for some of the learning problems exhibited by schizophrenics.

Summary

After an extensive literature review, Lang and Buss (1965) concluded that:

> ...the hypothesis of associative interference has been verified. Schizophrenics have more unique nonshared associations and...these associations, like external distractors, serve to deteriorate performance because of their intrusive nature (p. 83).

The evidence just outlined suggests that support for a broad associative interference and/or associational disturbance hypothesis is either equivocal or lacking. The structure-process distinction, which has been developed outside of psychopathology and only recently

applied to the study of schizophrenic verbal behavior, shows some indication of being more empirically fruitful than the older, more inclusive formulations.

CHAPTER III

FURTHER CONSIDERATIONS

In this chapter the procedure of this experiment will be further elaborated in the light of the content (structure)-process distinction.

Content refers to everything that is in the organism's associative repertoire. Structure maps out the particular relationships within this repertoire. Associative structures are usually pictured as networks of associations which are hierarchically organized (Pollio, 1968). These networks outline the relationships between words and word clusters.

Associative structures are presumed to be relatively stable. These are generally contrasted with process variables, which describe what a person is doing at a particular moment (Rozeboom, 1965). Therefore, responding "girl" and "play" to the stimulus word "boy" on a continuous WAT is an example of an associative process. However, the structural properties "girl" and "play" are presumed to exist in the absence of the stimulus "boy." Therefore, given the same structural arrangement and input conditions on a subsequent test, these same responses would generally be expected.

In this experiment, as in the above example, structure was inferred from the WAT. Initially all Ss were given a continuous WAT. Partly on the basis of their WAT test responses individual lists were constructed for each S. That is, from each S's WAT protocol associative clusters were selected and combined along with other buffer or filler words to form lists. Then, these tailor-made lists were presented to each S for recall.

With this procedure it was possible to estimate the strength of associative clusters for individual Ss. In brief, "strong" clusters were presumed to occur earlier in associative production than "weak" ones (Bousfield and Sedgewick, 1944).

It was expected that the stronger association clusters would be more readily organized and recalled than either the weaker ones or the filler words. The assumption here is that the underlying structure of these associations is more cohesive than those of the weaker ones or the unrelated filler words (Pollio, 1966). In part, Pollio (1966) describes cohesiveness as the degree of interrelatedness within a given cluster. It should be noted that no measure of cluster cohesiveness was taken except for the relative position of the cluster items within the WAT protocols.

This experiment has an advantage over other studies using lists based on normative data collected from college students, because it insures that the WAT items are in each S's associative repertoire. Therefore, every S should be equally familiar with these items, and the uneducated S should not be handicapped by them. The structure-process distinction as incorporated into this design is also particularly relevant to questions raised by Deese (1965). That is, are the associations of schizophrenics intrinsically disorganized or just organized on a more primitive level? Put another way, are the sometimes bizarre associations of schizophrenics unusual and disorganized or simply unusual? (In this study, no difference between the groups in the organization of WAT items would support the latter hypothesis.)

Furthermore, since the WAT clusters were systematically selected

from each S's own WAT protocols, content and in part associative structure was assumed to be held relatively constant across Ss. Therefore, if there are organizational and recall differences between the diagnostic groups these differences should be attributable to some process related to the utilization of associative structures; unless the structures of Ss were modified between the administration of the WAT and free recall tasks (approximately 24 hours). Thus, if the associative content of schizophrenics is unusual, but their ability process information is intact, there should be no organizational difference between the groups.

Essentially, then, this study addressed itself to the question of whether or not schizophrenia is basically an associational-process disturbance. That is, are organizational processes of schizophrenics impaired? Furthermore, the approach chosen for this study has the potential for providing a relatively clear-cut distinction between content and process, while at the same time controlling for error variance due to list artifact.

CHAPTER IV

METHOD

This experiment was designed to investigate the organizational processes of chronic schizophrenic and nonpsychotic patients. Subjects were first given the WAIS Vocabulary subtest followed by a word association test. Then, lists containing each S's own word association test responses, along with unrelated buffer words, were presented to the Ss in a free recall paradigm.

Design

This was a four factor experiment with repeated measurements; that is, a 2 X 24 X 2 X 7 design (Winer, 1962). The Ss, nested within two diagnostic categories (schizophrenic and nonpsychotic) were presented with two types of lists with seven trials on each list. The two lists were presented in quasi-random order within each of the subject groups so that half of each group received List I first, while the other half received List II before List I.

Material

Twenty-two common words were selected as stimuli for the word association test. These words are listed in Table II (Chapter VI) in order of presentation. The two 18-item word lists were individually constructed, in part, from each S's own word association test responses. This procedure is similar to that employed by Lang and Luoto (1962) in a paired-associates learning experiment. In List I three sets of stimuli, including the stimulus word from the word association test and the first two associations elicited, comprised nine

of the 18 items. Nine other words were selected on the basis that they had no obvious connection to each other or to the associatively related words. The two lists had no words in common and an attempt was made to limit the associative overlap between the two lists. List II was constructed in the same manner as List I except that the last three associations in any four-item response group comprised the nine associatively related stimulus words.

List I and List II were respectively designated "strong" and "weak" association lists. In support of such a classification, Bousfield and Sedgewick (1944) suggested that the more familiar associations to the stimulus word appear earlier in word associations response protocols than less familiar associations. In a later test of this hypothesis, Bousfield and Barclay (1950) found that associations of high frequency occurred earlier in word association test responses than those of low frequency associates.

Subjects

Forty-eight women, patients at Alberta Hospital, Edmonton, Alberta, served as Ss. Twenty-four carried a primary diagnosis of schizophrenia and had been hospitalized for a minimum of two continuous years. The division of the schizophrenic sample into diagnostic subtypes was as follows: simple schizophrenic, 3; catatonic schizophrenic, 3; chronic undifferentiated schizophrenic, 7; and paranoid schizophrenic, 12. In addition, all of the Ss included within this group were judged by the physician and/or head nurse in charge of the hospital ward to be relatively nonremitted. That is, at the time of testing, these Ss were considered to be displaying active psychotic

symptoms such as disorientation, hallucinations, and delusions. Demographic data relevant to both subject groups is presented in Table I.

The remaining 24 Ss were psychiatrically classified as nonpsychotic. In addition, they were judged by a member of their ward staff to be displaying no psychotic symptoms. The following diagnostic subtypes were included in this group: inadequate personality, 4; neurotic depression, 6; emotionally unstable personality, 7; mixed psychoneurosis, 2; adolescent behavior disorder, 1; passive-aggressive personality, 2; and anxiety neurosis, 2.

Patients who received electroshock therapy within 60 days of the initial testing, and those who scored below a scaled score of four on the vocabulary subtest of the Wechsler Adult Intelligence Scale were excluded from this experiment.

Forty-five of the Ss tested were taking one or some combination of sleeping pills, energizers, or tranquilizers prior to testing. There exists experimental evidence which appears to indicate that different chemotherapy treatments affect cognitive functioning in different ways (Downing, Ebert, and Shubrooks, 1963). Therefore, for these Ss medication was discontinued for a five day period. Three nonpsychotic patients were not receiving medication prior to or during testing.

Ten Ss were unable to complete the experiment after being removed from their medication. One of these Ss eloped from the hospital; four others were judged by the hospital staff to be too sick to continue, and these patients were immediately returned to their medication. Three Ss were inadvertently given drugs before the five day period had

TABLE I

DEMOGRAPHIC DATA ON
SCHIZOPHRENIC AND NONPSYCHOTIC SUBJECTS

	Schizophrenics	Nonpsychotics
Education:		
Range	5 - 13 yrs.	7 - 12 yrs.
$\bar{X}$	9.79 yrs.	9.33 yrs.
Age:		
Range	24 - 59 yrs.	18 - 60 yrs.
$\bar{X}$	42.9 yrs.	39.9 yrs.
Continuous Hospitalization:		
Range	2 - 24 yrs.	1 mo. - 3 yrs. 10 mo.
$\bar{X}$	7.0 yrs.	9.12 mo.
WAIS Vocabulary:		
Raw Score Range	17 - 70	11 - 62
Raw Score $\bar{X}$	38.83	36.5
Scale Score Equivalent of Raw Score $\bar{X}$	9	9
Scaled Score Range	5 - 15	4 - 13

elapsed. One S was discharged and another was working away from the hospital on the final day of testing.

Procedure

WAIS Vocabulary subtest. Most Ss were given the WAIS Vocabulary subtest prior to being removed from drugs. However, some Ss were not available at that time, and these patients completed the vocabulary test at least 24 hours after the free recall test.

Word association test. The 45 Ss whose medication was discontinued received the word association test on day four of the five day period. The remaining three Ss were tested at the first available opportunity. Each S was given one minute in which to verbally transmit as many associations to each stimulus word as she could. This technique is roughly equivalent to Noble's (1952) procedure for establishing m (meaningfulness); however, his Ss were required to write down their associations. See the Appendix for the complete instructions for this task. Ss' responses were recorded by the E and at the end of one minute, the E said "time's up," and then proceeded to the next word.

Free recall learning. All Ss were given a free recall test on the day following the word association test. On this task the Ss were instructed to pronounce each word and try to remember it. The complete instructions for the task are presented in the Appendix.

The stimulus words were typed in capital letters and centered on plain white 3 X 5 inch cards. These were placed on a small wooden stand approximately 24 inches from the S, who had approximately two seconds in which to view and pronounce each word. After the final

card in each list had been presented, the S was asked to count backwards from 200 for a 30 second interval. Postman and Phillips (1965) have demonstrated that this procedure significantly reduces the recency effect. Therefore, organization should be governed more by the characteristics of the words in the lists, and not by a tendency to recall terminal items, regardless of their characteristics. Following the counting procedure, the Ss were allowed two minutes for recall, after which time the cards were shuffled before the next presentation. This procedure was repeated for seven trials on both lists. A two minute rest period was permitted before the presentation of the second list.

CHAPTER V

RESULTS

Word Association Test

Since the WAT was primarily used as a technique for establishing associative content, only a brief analysis of this task will be presented. The WAT protocols were leniently scored; i.e., only repetitions were not counted. The mean number of WAT responses to each stimulus word (Table II) shows that there was a great deal of similarity in the response patterns of the two groups. The overall means for the two groups (Table II) summed across all words are close enough for the purposes of this experiment to preclude testing for significance. While the number of WAT responses of schizophrenics and nonpsychotic Ss to the stimulus items are roughly equivalent, the individual variability among Ss is marked. For example, within the schizophrenic group the range of the mean WAT scores was 4.23 to 14.14, and in the nonpsychotic group it was 3.14 to 14.50.

Free Recall

Combined scores. An analysis of the recall means shows the superior performance of the nonpsychotic group on both lists (Table III). The difference between the mean recall of schizophrenic and nonpsychotic Ss was 1.20, and on List II it was 1.78. Therefore, schizophrenics experience slightly more difficulty on the recall of List II words. An analysis of variance of the combined recall scores (Table IV) indicates that learning; i.e., the progressive increase in recall means over trials (T), was the only significant factor ($p < .01$); however, the differences between the diagnostic groups did

TABLE II

MEAN NUMBER OF WORD ASSOCIATION TEST RESPONSES
BY BOTH DIAGNOSTIC GROUPS

Stimuli	Schizophrenic	Nonpsychotic	Stimuli	Schizophrenic	Nonpsychotic
1. Music	6.96	8.33	12. Insect	7.21	7.04
2. Law	6.50	5.66	13. Cars	8.21	8.17
3. Track	5.37	5.66	14. Cabbage	6.83	6.42
4. Clothes	8.79	10.12	15. Younger	6.04	5.29
5. River	7.25	7.37	16. City	8.70	9.29
6. Night	7.42	6.42	17. Finger	6.42	6.42
7. Church	8.87	8.83	18. Cigar	7.00	6.71
8. Chair	6.96	6.17	19. Hammer	6.71	5.58
9. Soldier	8.04	7.50	20. Fear	6.00	4.83
10. Sick	7.75	7.58	21. Paper	8.01	7.75
11. Tree	7.75	8.66	22. Breast	5.71	5.08
			OVERALL	7.18	7.079

TABLE III

MEAN NUMBER OF ITEMS RECALLED ON
LIST I AND LIST II BY BOTH DIAGNOSTIC GROUPS

	Schizophrenic		Nonpsychotic	
Source	List I	List II	List I	List II
Combined 1 (WAT + Buffer)	10.99	10.39	12.19	12.17
WAT Items	6.28	5.84	6.93	6.74
Buffer Items	4.76	4.54	5.26	5.42

TABLE IV

ANALYSES OF VARIANCE OF RECALL SCORES FOR
WORD ASSOCIATION TEST, BUFFER, AND COMBINED WORDS

Source	Combined			WAT Items		Buffer Items	
	df	MS	F	MS	F	MS	F
A (Diagnosis)	1	370.54	3.41	100.60	3.53	78.72	2.47
Error (A)	46	108.52		28.51		31.82	
B (Lists)	1	16.41	2.38	16.72	4.22*	.09	-
A x B	1	14.59	2.12	2.63	-	16.09	1.92
Error (A) x B	46	6.89		3.96		3.18	
T (Trials)	6	632.11	218.20**	101.78	65.66**	228.54	147.45**
A x T	6	4.99	1.73	1.31	-	3.31	2.14*
Error (A) x T	276	2.89		1.55		1.55	
B x T	6	3.56	1.62	3.02	2.65*	.66	-
A x B x T	6	2.71	1.24	1.80	1.58	.63	-
Error (A) x B x T	276	2.19		1.14		1.10	
TOTAL	671						

* significant at the .05 level of probability.
** significant at the .01 level of probability.

approach significance ($p < .10$).

Word association test items. Breaking down the combined recall scores (Table III), it is evident that schizophrenics recalled fewer WAT words on both lists (Figure I); however, the overall difference between the groups (Table IV) only approached significance ($p < .10$). For both groups mean recall was found to be greater on List I than List II ($p < .05$). However, the recall differences between the lists were larger in the schizophrenic group (.44 vs .19). List X Trials was the only significant interaction, and this seems to indicate a more rapid improvement on List I than List II. In brief, the analyses of the WAT words provides relatively clear support for the "strong-weak" designation of Lists I and II respectively.

Buffer or filler words. A further breakdown of the list components (Table III) reveals that the buffer word means of nonpsychotics were also higher than those of schizophrenics; however, group differences (Table IV) were not significant. It was also found that the form of the recall scores for the two groups (Diagnosis X Trials) differed across trials ($p < .05$). In contrast to the WAT words, within both patient groups differences in mean recall on Lists I and II were quite small and nonsignificant. Therefore, it appears that the buffer words were more or less neutral. Furthermore, the recall of these words did not seem greatly affected by the WAT words in the "strong" and "weak" lists. In addition, it should be noted that the recall trends in each group were different. That is, schizophrenics recalled more buffer words on List I than List II, while the opposite trend occurred for nonpsychotic Ss. Despite this difference the List X

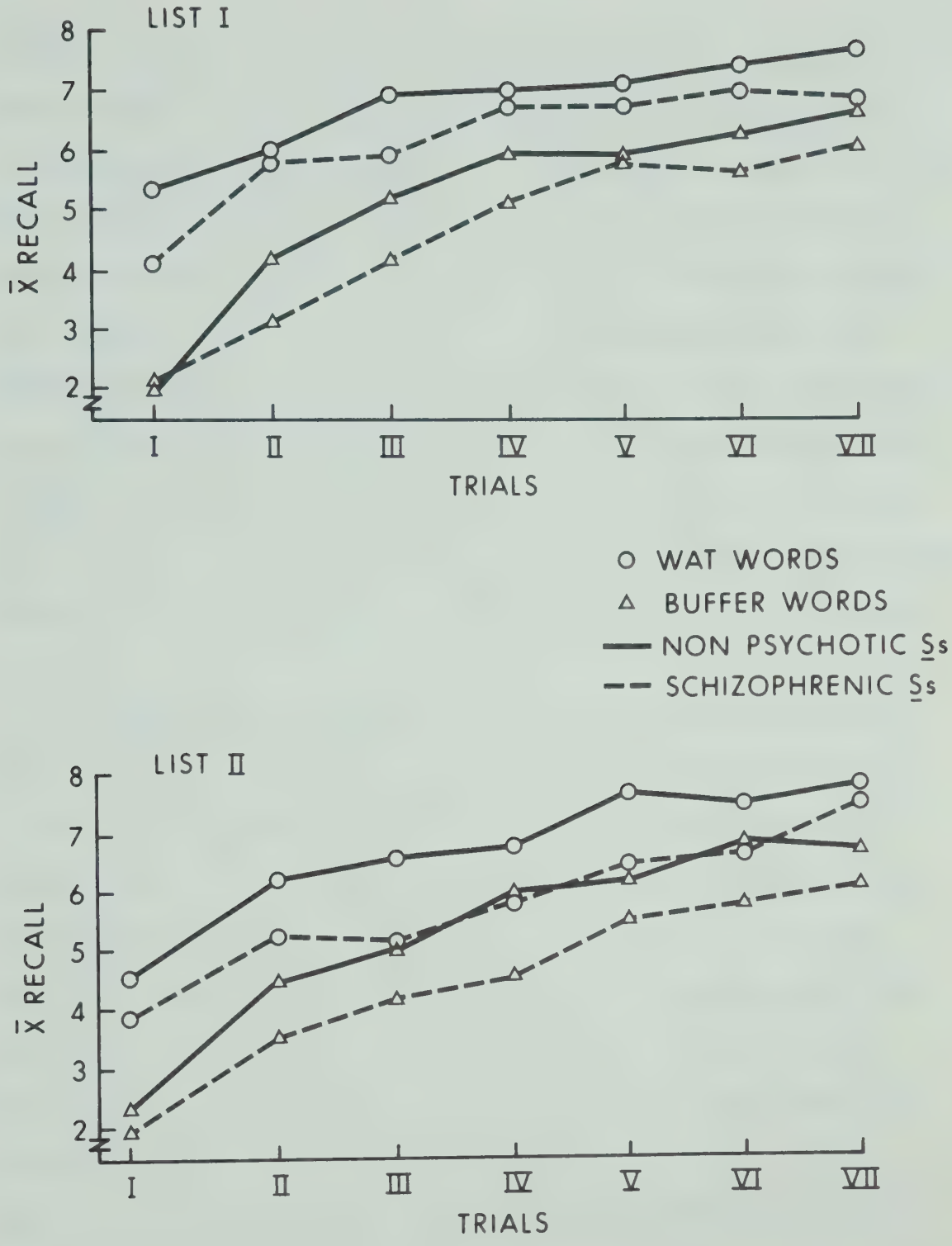

Figure I: Mean recall of word association test and buffer words of both diagnostic groups over seven trials of Lists I and II.

Diagnosis interaction was not significant (Table IV). Moreover, on Lists I and List II both groups recalled more WAT than buffer words.

Comparison of Lists I and II. In order to get a clear picture of where the group differences occurred, the recall scores between the groups were evaluated on each list separately. For both the combined words and WAT items no significant differences between the groups occurred on List I, but on List II nonpsychotics recalled significantly more words on both measures [$F(1, 46) = 4.77$ and 4.28 respectively; $p < .05$]. The same trend occurred for the buffer words, but the difference between the groups on List II did not quite reach significance. In brief, the recall deficit of schizophrenics seems to be greater on List II.

Ceiling effect. An examination of the raw data revealed that nonpsychotic Ss achieved the maximum recall of 18 words on 30 out of a possible 336 trials, while the schizophrenic group obtained only 9 perfect recalls. This suggests that a ceiling effect could have diminished the overall group differences. An analysis of the recall scores for the first five trials indicated the combined scores of nonpsychotics were significantly higher than those of schizophrenics [$F(1, 46) = 4.57$; $p < .05$]. Thus, for the combined recall measure, the ceiling effect hypothesis was supported; however, on the five trial analysis, there were no significant group differences on the recall of buffer and WAT words.

In sum, the following trends appear to indicate that:

1. Nonpsychotic recall was superior to that of the schizophrenic group.

2. The differences in the recall means between the groups were larger on List II than List I; however, none of the List X Diagnosis interactions were significant.

3. The earlier "strong-weak" designation of WAT items on Lists I and II respectively was supported.

Measures of Organization

Organization in the free recall experiment is reflected in the sequential ordering or grouping of words during output. In this experiment two measures of organization, stimulus category repetition (SCR) and intertrial repetition (ITR) were used in the analyses.

Stimulus category repetition (SCR). In the present study SCR is a measure of the sequential occurrence of two or more associatively related words from any single response group or category. For each S the obtained amount of clustering O(SCR) on each trial was determined by summing over the number of times a word from one associatively related response group was followed by another word from the same group. Then, O(SCR) is always one less than the number of items recalled in an associative category. For example, given the following associatively related response groups: boy, girl, play; and pine, spruce, grove, in the following output arrangement: pomade, (boy, play) zero, (spruce, pine, grove), dipper, girl, boy. Then the total O(SCR) score for this sequence would equal 3.0. The reasons for not scoring the "girl-boy" grouping will be discussed later. In this experiment there were three associatively related response groups or categories within each list; therefore, the maximum O(SCR) on each trial was 6.0.

In addition to O(SCR), an expected value E(SCR) was computed

according to a formula outlined by Bousfield and Bousfield (1966). E(SCR) is an estimate of how much clustering would be expected from an n item list with k nonoverlapping associative response groups or categories, if output were random. Summing over all associative response groups, $E(SCR) = \left[(m_1^2 + \ldots + m_k^2)/n\right] - 1$; where m_k is the number of words recalled in the kth response group, and buffer words are treated as a single category. Therefore, in this experiment if all 18 words are recalled, E(SCR) = 1.0.

Since nothing has been reported about the underlying distribution of E(SCR) and to this author's knowledge it has never been used in a mixed list design, a computer check was employed. That is, a program was written which randomly generated without replacement all possible combinations of lists, 5,000 at a time, and then scored them according to the procedure just outlined. The expected values obtained by this technique were usually within .02 of the ones computed according to Bousfield and Bousfield's (1966) formula. Thus, E(SCR) can be appropriately used in a mixed list design.

The scoring of O(SCR) will now be further considered. In the development of E(SCR) Bousfield and Bousfield (1966) implicitly assume that sampling is done without replacement. However, when the S's output is verbal rather than written, repetitions do occur. Taking this into consideration two scoring methods were developed in order to evaluate fairly the recall of both patient groups.

In the "tough" method, repetitions were not scored. That is, if a word occurred twice during output on any given trial, then on its second appearance it is not eligible to form a scorable response

cluster (as in the above "girl-boy" example). In the "easy" scoring method a word given earlier in a free recall trial had the potential to form a scorable grouping with another word, later in that sequence. Therefore, in the above example, the "girl-boy" grouping would rate an O(SCR) score of 1.0. A comparison of the two scoring procedures indicated that the forms of the two distributions within each group were virtually identical, and that the "easy" method produced higher means on all trials. Therefore, the "tough" technique for scoring O(SCR) was used, because it best approximates the "sampling without replacement" assumption.

In this experiment, O(SCR) is confounded by the number of WAT words and the number of associatively related response groups recalled. That is, the greater the number of WAT words and associative response groups recalled, the greater is the opportunity for clustering. However, with the O(SCR) this fact is not considered. Therefore, E(SCR) scores were subtracted from O(SCR) scores to yield difference scores, D(SCR) $\left[D(SCR) = O(SCR) - E(SCR)\right]$, which are free from the influence of random error. All further analyses employed this measure.

The D(SCR) means of the nonpsychotic group were higher on both lists (Figure II) than those of schizophrenic Ss (Table V). In addition, the mean D(SCR) in both groups were higher on List I than List II. An analysis of variance (Table VI) indicates that these trends were significant. That is, the overall clustering of the nonpsychotic group was superior ($p<.05$), and for both groups there was more clustering on List I than List II ($p<.01$). The significant trials factor is a product of an increase in organization over trials.

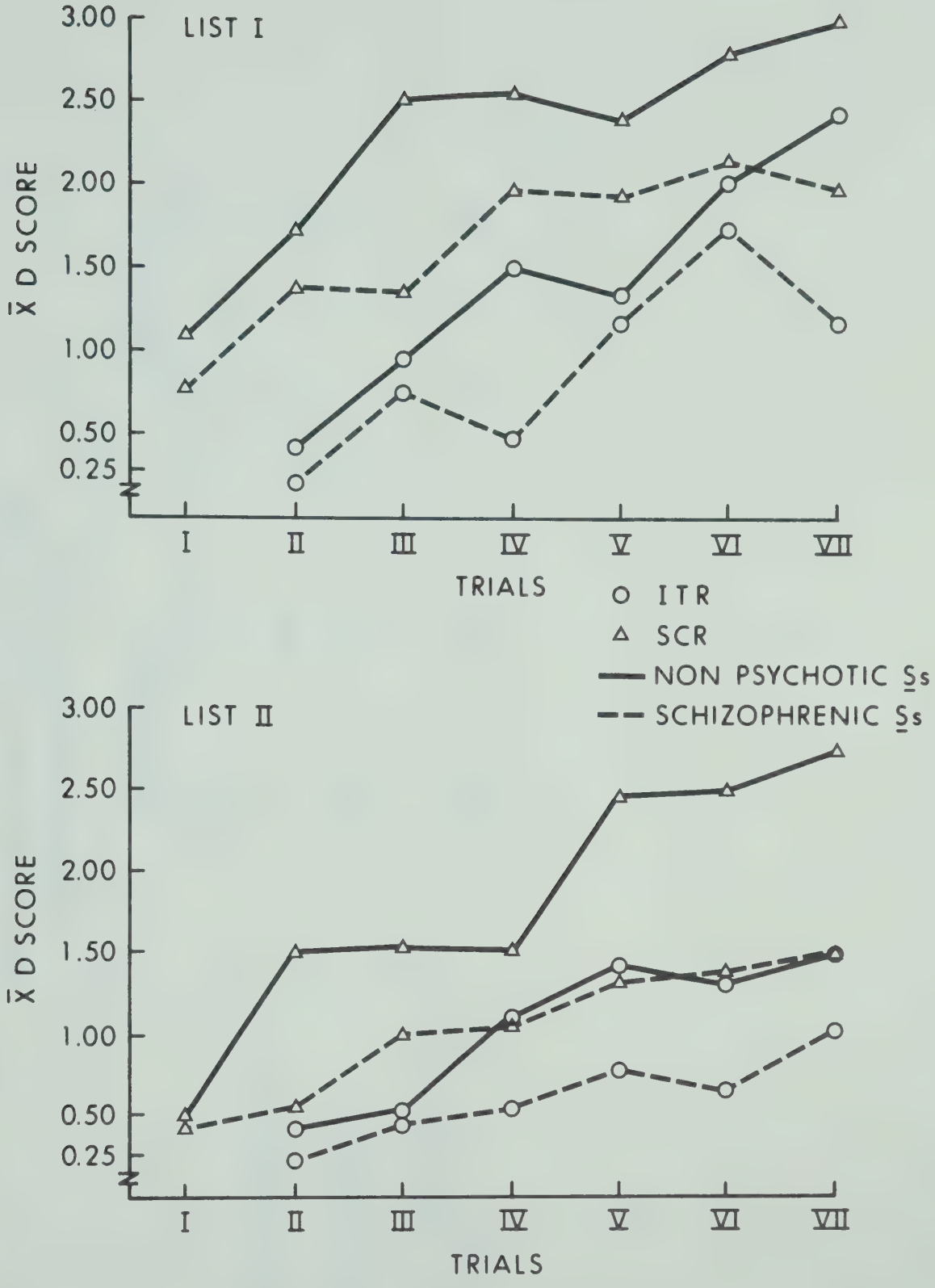

Figure II: Mean organizational difference scores of both diagnostic groups over seven trials of Lists I and II.

TABLE V

MEAN ORGANIZATIONAL DIFFERENCE SCORES

FOR BOTH DIAGNOSTIC GROUPS

	Schizophrenic		Nonpsychotic	
Source	List I	List II	List I	List II
Stimulus Category Repetition O(SCR) - E(SCR)	1.66	1.06	2.34	1.82
Intertrial Repetition O(ITR) - E(ITR)	.94	.63	1.48	1.06
Intertrial Repetition Scores with Stimulus Category Repetition Scores Deleted	.64	.45	.76	.79

TABLE VI

ANALYSES OF VARIANCE ON BOTH MEASURES OF ORGANIZATION

Source	Stimulus Category Repetition O(SCR) - E(SCR)			Intertrial Repetition O(ITR) - E(ITR)		
	df	MS	F	df	MS	F
A (Diagnosis)	1	87.89	6.38*	1	33.85	4.49*
Error (A)	46	13.77		46	7.54	
B (Lists)	1	53.17	12.19**	1	19.06	7.11*
A x B	1	.29	-	1	.47	-
Error (A) x B	46	4.36		46	2.68	
T (Trials)	6	30.65	29.22**	5	21.98	14.27**
A x T	6	2.42	2.31*	5	2.45	1.59
Error (A) x T	276	1.05		230	1.54	
B x T	6	1.38	1.89	5	3.05	2.04
A x B x T	6	1.39	1.91	5	1.67	1.12
Error (A) x B x T	276		.73	230	1.49	
TOTAL	671			575		

* significant at the .05 level of probability.
** significant at the .01 level of probability.

Furthermore, the significant Diagnosis X Trials interaction ($p < .05$) suggests that the form of this increase was different in each group (Figure II).

Looking at the differences between the group means on each list, these differences are greater on List II than List I. An analysis of list differences indicates that the clustering performance of nonpsychotics was significantly higher than those of schizophrenics on List II [$F(1, 46) = 7.30$; $p < .01$]. However, on List I the differences between the groups nearly approached significance [$F(1, 46) = 3.42$; $p < .10$]. It should be noted that the diagnostic group differences on List II seem to be accentuated, because of more homogeneity of variance on this list.

It was also found that the overall D(SCR) mean, obtained by summing across all trials of both lists, was significantly greater than zero [$t\ (23) = 17.80$; $p < .005$]. Thus, it would appear that although schizophrenics exhibit less organization than nonpsychotics, their responses were not totally disorganized.

Intertrial repetition (ITR). The second measure of organization employed, i.e., intertrial repetition (ITR), was developed by Bousfield and Bousfield (1966). ITR is essentially a measure of the consistency of output between two trials. Obtained intertrial repetition O(ITR) is found by counting the number of pairs of items that occur together in the same order on two successive trials. It should be noted that this measure does not specify the items that can be grouped together; therefore, it has the potential to tap idiosyncratic orderings.

In order to control for random error, an expected value E(ITR) was computed according to the formula: $E(ITR) = \left[c\ (c - 1)\right]/hk$, where c = the number of words common to two consecutive trials, h = the number of words recalled in Trial t_1, and k = the number of words recalled on Trial t + 1. Then, E(ITR) is a measure of the sequential ordering of pairs common to two trials that would be expected if output were random.

A difference score D(ITR) was obtained for every consecutive two-trial sequence on both lists $\left[D(ITR) = O(ITR) - E(ITR)\right]$. D(ITR) was used in all the analyses, except the one outlined in Table VII.

As with O(SCR), the scoring of O(ITR) was complicated by the repetition of words within the same recall sequence and a similar approach to scoring was adopted. That is, given two consecutive outputs, if a word occurred twice within either one of these trials, then on its second appearance in the same trial it was not eligible to be paired with another word. For example, with the following outputs: boy, play, zero, spruce, pine, grove, dipper, girl, and boy on Trial t and (boy, (play), (zero), spruce), grove, pine (dipper, girl), boy, and grenade on Trial t + 1, the O(ITR) score would be 4.0 (the items in parentheses indicate the scorable groupings) and the girl-boy sequence would not be counted.

There are problems with the ITR measure in that it is sensitive in only one direction, and that it only measures pairwise consistencies. Therefore, in the above example, the presumably related "spruce, grove, pine" grouping is not counted, because the word orders on Trials t and t + 1 were different. In brief, ITR is a crude

measure, which could be insensitive to some forms of idiosyncratic organization.

The overall analyses of ITR scores (Tables V and VI) show the same significant factors as the SCR analysis, except that the Diagnosis X Trials interaction is nonsignificant. This is not surprising since SCR and ITR are highly correlated (overall $r = .61$, $p < .01$).

Since it is obvious that the ITR measure is confounded by the clustering of associatively related words, the organizational deficit of schizophrenics on the overall ITR measure could have been caused by their failure to organize the WAT words. Therefore, the response protocols were rescored, and all O(ITR)s which were the result of orderings within, and not between, WAT response clusters were not counted. An analysis of the diminished O(ITR) scores showed that the performance of nonpsychotic Ss was relatively superior (Tables V and VII), but the difference between the groups did not quite reach significance. Since no E(ITR) measure was computed, random error could have influenced these results. In sum, there was little evidence to suggest greater idiosyncratic organization on the part of schizophrenic Ss.

Error Data

In the following analyses only intrusion errors will be considered. Intrusion errors refer to words given by Ss during output which are not included in the stimulus material.

Other studies have reported that schizophrenics make more errors than normals or other neuropsychiatric patients (e.g., Lang and Luoto,

TABLE VII

ANALYSIS OF VARIANCE OF OBTAINED INTERTRIAL REPETITION SCORES WITH STIMULUS CATEGORY REPETITION ITEMS DELETED

Source	df	MS	F
A (Diagnosis)	1	6.67	3.12
Error (A)	46	2.14	
B (Lists)	1	.56	-
A x B	1	1.17	1.08
Error (A) x B	46	1.09	
T (Trials)	5	7.39	10.26**
A x T	5	.72	-
Error (A) x T	230	.72	
B x T	5	.95	1.20
A x B x T	5	.51	-
Error (A) x B x T	230	.79	

** significant at the .01 level of probability.

1962). However, in this study, schizophrenics gave fewer intrusion errors than nonpsychotics (Table VIII), but the difference between the groups was not significant (Table IX). Schizophrenics also made more errors on List II than List I, while the opposite occurred for nonpsychotic Ss. However, the List X Diagnosis interaction was nonsignificant.

TABLE VIII

ANALYSIS OF INTRUSION ERRORS ON LIST I AND LIST II

Schizophrenic Subjects:

Source	List I	List II	Total
Number of errors	25	71	96
$\bar{X}$ per S	1.04	2.96	-
Number of 1st List Intrusions	10	34	44
% of 1st List Intrusions	40%	48%	46%

Nonpsychotic Subjects:

Source	List I	List II	Total
Number of errors	57	49	106
$\bar{X}$ per S	2.37	1.67	-
Number of 1st List Intrusions	39	23	62
% of 1st List Intrusions	68%	47%	58%

TABLE IX

ANALYSIS OF VARIANCE OF INTRUSION ERRORS

Source	df	MS	F
A (Diagnosis)	1	.15	-
Error (A)	46	1.64	
B (Lists)	1	2.15	1.18
A x B	1	4.34	2.39
Error (A) x B	46	1.81	
T (Trials)	6	.37	1.06
A x T	6	.06	-
Error (A) x T	276	.35	
B x T	6	.27	-
A x B x T	6	.13	-
Error (A) x B x T	276	.29	
TOTAL	671		

A Correlational Analysis of Dependent Variables

TABLE X

CORRELATIONS BETWEEN DEPENDENT VARIABLES

Variables	Schizophrenics	Nonpsychotics	Overall
$\bar{X}$ Recall - $\bar{m}$	.29	.51**	.38**
$\bar{X}$ Recall - $\bar{D}$ SCR	.76**	.78**	.80**
$\bar{X}$ Recall - $\bar{D}$ ITR	.45*	.78**	.66**
$\bar{m}$ - $\bar{D}$ SCR	.21	.35	.26
$\bar{m}$ - $\bar{D}$ ITR	.13	.34	.21
$\bar{D}$ SCR - $\bar{D}$ ITR	.38	.74**	.61**

* significant at the .05 level of probability.

** significant at the .01 level of probability.

For nonpsychotic Ss the correlation (Table X) between the combined recall scores for each S ($\bar{X}$ Recall) and each S's average number of WAT responses ($\bar{m}$) was significantly different than no correlation at all ($r = .51$, $p < .01$). Although there was a positive relation between recall and $\bar{m}$ (.29) in the schizophrenic group, it was not significant. This indicates that associative production in the schizophrenic group was minimally related to recall. It should also be noted that each S's average ITR and SCR scores, D(ITR) and D(SCR), were only slightly correlated with $\bar{m}$. It was reported earlier that numerically, the overall associative content between the groups was virtually identical. However, in the light of the low correlations between $\bar{m}$ and the measures of organization within both groups, and recall within the schizophrenic group, this finding was of little consequence.

In addition, there was a high, positive, and significant relationship between D(SCR) and recall (overall $r = .80$, $p < .01$). Intertrial repetition and recall were also significantly correlated (overall $r = .66$, $p < .01$). Therefore, in both groups organization scores were associated with relatively higher recall. Moreover, both measures of organization were highly correlated with each other; however, in the schizophrenic group this relationship did not quite reach significance ($p < .07$). This indicates that in both groups many of the ITR pairings consisted of WAT response clusters.

An Analysis of Control Variables

With a repeated measures design employing organismic variables, such as the one used in this experiment, controls must be effective before the results can be generalized to the populations in question. With respect to the present study, was the recall and organizational deficit of schizophrenic Ss caused by some psychotic process or by other factors? In an attempt to answer this question, the relationships between recall, the measures of organization, and the control variables, such as age, WAIS vocabulary scores, hospitalization and education were examined. Before exploring these relationships, it should be noted that the attempt to match the groups on age, WAIS scores, and education (Table I) was fairly successful; however, the schizophrenic group had been hospitalized considerably longer than nonpsychotic patients.

In general, hospitalization has been found to be negatively related to performance (Wynne, 1963), but this finding has not always been upheld (e.g., Dokecki et al., 1968). As might be expected, the

recall and D(SCR) scores of both groups were negatively correlated with hospitalization (Table XI); however, only when the scores of both groups were combined did these relationships become statistically significant ($r = .32$, $p < .05$). Thus, it appears that within each group hospitalization did not greatly affect performance.

The relationship between the WAIS vocabulary scores and recall scores are more complex than the ones involving hospitalization (Table XI). That is, in the nonpsychotic group the correlation between WAIS scores and recall was .08, while in the schizophrenic group this relationship was significant ($r = .52$, $p < .01$). In brief, it is possible that the WAIS vocabulary measure may have been a poor estimate of the IQ of nonpsychotic Ss. Thus, the recall deficit of schizophrenic Ss might have been caused by a relatively lower IQ.

Since the correlation between vocabulary and education was the same in both groups ($r = .55$, $p < .01$), it is not surprising that the recall-education and recall-WAIS vocabulary relationships are similar. That is, in the schizophrenic group, education was significantly correlated with recall ($r = .51$, $p < .01$), but the relationship for nonpsychotics was negligible ($r = .04$). Thus, education was not a particularly effective control variable.

As with education, the attempt to match the ages of both groups does not appear to have been very effective. That is, age and recall were negatively correlated for nonpsychotic Ss ($r = -.52$, $p < .01$). However, age was positively correlated with recall in the schizophrenic group ($r = .18$). Furthermore, in the nonpsychotic group as age increased, so did length of stay in the hospital and WAIS vocabulary

TABLE XI

CORRELATIONAL DATA ON CONTROL AND DEPENDENT VARIABLES

Variables	Schizophrenics	Nonpsychotics	Overall
$\overline{X}$ Recall - Education	.51	.04	.21
$\overline{X}$ Recall - Errors	-.11	-.54**	-.32*
$\overline{X}$ Recall - Hospitalization	-.23	-.38	-.32*
$\overline{X}$ Recall - Age	.18	-.52**	-.28
$\overline{X}$ Recall - WAIS Vocabulary	.52**	.08	.25
Age - Hospitalization	-.27	.56**	.30*
Age - WAIS Vocabulary	.07	.42*	.27
Age - m	-.22	-.28	-.25
WAIS Vocabulary - Education	.55**	.55**	.56**
WAIS Vocabulary - m	.41*	.30	.37*
WAIS Vocabulary - $\overline{D}$ SCR	.29	.30	.25
WAIS Vocabulary - $\overline{D}$ ITR	.42*	.12	.24
Education - m	.31	.29	.31*
Education - $\overline{D}$ SCR	.33	.31	.26
Education - $\overline{D}$ ITR	.27	.04	.12
Hospitalization - $\overline{D}$ SCR	-.14	-.19	-.32*
Hospitalization - $\overline{D}$ ITR	.00	-.36	-.22
Error - $\overline{D}$ SCR	-.22	-.52**	-.33*
Error - $\overline{D}$ ITR	-.23	-.59**	-.37**

* significant at the .05 level of probability.
** significant at the .01 level of probability.

scores, but recall decreased. Because the hospital-recall and WAIS vocabulary-recall correlations were nonsignificant, age seems to be an important variable in determining recall within the nonpsychotic group. In sum, the above analyses of the correlational data (Table XI) indicate that the attempts to equate the two diagnostic groups on age, education, and WAIS vocabulary score were at best only minimally successful.

CHAPTER VI

DISCUSSION

The major findings of this study were:

1. Schizophrenics show an organizational deficit. Specifically, since associative content was held relatively constant for each S, the deficit functioning of schizophrenic Ss appears to be attributable to some process difference between the groups.

2. The combined recall scores of schizophrenic Ss also indicate deficit functioning.

3. Schizophrenics are not totally disorganized.

4. Evidence for greater idiosyncratic organization on the part of schizophrenic Ss was either equivocal or lacking.

5. The deficit performance of schizophrenic Ss was greater on List II than List I.

As noted earlier, organization and recall in both patient groups were highly correlated. This finding supports Tulving's (1968) hypothesis that learning is a function of the strengthening of interitem associations. Organization appears necessary, because memory is a limited capacity storage system (see Miller, 1956, Chapter I). Viewed from this perspective, free recall learning has been seen as a process of recoding information, storing the coded information, and finally retrieving it (Mandler, 1967). Thus, the deficit of schizophrenic Ss may occur somewhere in the associative forming stages. That is, some process(es) could have prevented schizophrenics from organizing the material, especially on the "weak" list. To the extent that structure is seen as facilitating recall, weaker structural units seem to be

most affected by this process(es).

However, these findings must be cautiously interpreted, because several factors, other than the experimental manipulations, could have influenced the results. For example, although the length of hospitalization did not appear to be a major factor in the performance of schizophrenic Ss, it could have contributed to the differences between the groups. Several authors have suggested that the routine within large mental institutions contributes to emotional flatness, passivity, and feelings of helplessness among chronic patients (e.g., Mednick and McNeil, 1968; Wynne, 1963).

Regardless of hospitalization, Garmezy (1964) has suggested that in schizophrenia learning deficits do not appear to be primary deficits. That is, they do not seem to be the result of a psychotic process(es). Instead he proposes that the deficit functioning of schizophrenic Ss in learning experiments appears to be a product of uncooperativeness and/or a low level of motivation. In this experiment the overall m and recall means were used to roughly estimate the contribution of these factors. The overall WAT means failed to indicate group differences, and although the schizophrenic group recalled less words, all Ss in this group showed a substantial increase in performance over trials.

Furthermore, the control variables such as age, IQ and education were differentially correlated with the measures of learning and organization. Most importantly, the estimate of learning potential in the nonpsychotic group may have been inaccurate, and the differences between the groups could have been a product of this deficiency.

In future experiments it would seem worthwhile to obtain both a verbal and nonverbal estimate of IQ, and then use the higher estimate as an indication of the Ss' ability.

In addition, there is no way to accurately evaluate the effects of the drug control. The reported and observed condition of some patients improved, while that of others declined. In most cases the schizophrenics were taking heavier dosages, and had been on medication longer than nonpsychotic Ss. Therefore, their withdrawal reaction might have been more acute.

Another consideration that must be entertained concerns the manipulation of associative strength. It was noted in the last chapter that for the recall of WAT words, the difference between the list means was greater in the schizophrenic (.44) than the nonpsychotic (.19) group. Therefore, the relative position of clusters within the WAT protocols (an indication of associative strength) had a greater effect on the mean recall within the schizophrenic group. As a result, it is possible that the "weak" associative clusters of nonpsychotics may have been "stronger" and/or more cohesive than those of their schizophrenic counterparts.

Furthermore, it has been found that the associative deficit of schizophrenics may be confined to the speaker role; i.e., to the production of associations (Cohen and Camhi, 1967). Therefore, one would expect that the associations produced by schizophrenics on the WAT would be less effective as stimuli on the free recall task. In this experiment a question arises as to whether or not the organizational deficit of schizophrenics occurred on the WAT or during free recall.

The finding that the overall m means of the two groups were virtually identical would tend to support the latter hypothesis; however, this analysis is not conclusive. Further support for this position is provided by the Lauro (1962) study, in which schizophrenics exhibited an organizational deficit on normative material. If the present author had matched pairs of nonpsychotic and schizophrenic Ss, then presented each member of the pair with the other's list, further insight into this problem could have been obtained. However, the reader will have to be content with some doubt as to where the differences between the groups occurred, and what caused them.

Theoretically, the results give a still broader base to the hypotheses of the Chapman group (1964). Furthermore, they are in line with the findings of Lauro (1962) and Deckner and Blanton (1969). According to the Chapman group the schizophrenic should experience more difficulty with "weaker" associative material. Not only are the organizational and recall differences between the groups in line with this hypothesis, but schizophrenics also exhibited more intrusion errors than nonpsychotics on the "weak" list. Although the Chapman et al. (1964) hypothesis predicts the outcome of this experiment, it does not explain it.

Many process theories have been advanced to account for the higher-order deficits of schizophrenics. These hypotheses generally center around the operationally defined concepts of inattention, motivation, anxiety, and associative disturbance and/or interference (broadly defined). In this experiment all or some combinations of these hypotheses are generally in line with the results. Although

these hypotheses could account for the organization and learning deficits of schizophrenic Ss, they would not generally lead one to expect larger differences between the patient groups on List II.

Arieti (1959) has suggested that schizophrenic organization is primitive. However, if schizophrenics are highly organized, but at a relatively lower level than nonpsychotic Ss, the SCR-ITR measures failed to detect it. In all fairness to hypotheses such as Arieti's, the concept of primitive functioning can be described as child-like, impulsive, uncooperative, fearful, characterized by instinctual urges, and so on. Therefore, one could expect a great deal of fluctuation in the day-to-day performance of schizophrenics, and motivation to learn would be a primary consideration in evaluating research. Even discounting the influence of motivation and other control variables, ITR is a unidirectional measure, and in this experiment it was confounded by the WAT response clusters. However, these clusters are idiosyncratic, and as a result, the primitive organizer should not be handicapped by them. Thus, the evidence supporting hypotheses such as Arieti's (1959) is lacking. On the other hand, this experiment was not a crucial test of these hypotheses.

The failure of the older theories to garner empirical support should give impetus to the theoretical and empirical development of the structure-process distinction. In addition, this development could have broad clinical implications. That is, aberrant responses, viewed from this perspective, may indicate either some structural deficiency or temporary deviation from an otherwise normal structure. According to Moran, Medford, and Kimble (1964) long term psychotherapy

might be more effective in treating structural problems. On the other hand, process disturbances should be more amenable to somatic treatment such as tranquilizers. The temporary but dramatic improvement in the WAT responses of a schizophrenic following chemotherapy and EST (reported in Chapter III) is an illustration of this point (Moran, Medford, and Kimble, 1964). In this example latent normal-like "structures" were presumed to have emerged following treatment. In spite of the obvious potential of this distinction, its application to schizophrenic verbal problems has not kept pace with corresponding developments using normal Ss. Methodological problems seem to be, in part, responsible for this lag.

For example, an ideal study of schizophrenic verbal behavior should control for the following variables: paranoid-nonparanoid diagnosis, remitted-nonremitted condition, type of housing (open or closed ward), medication, sex differences, IQ, good-poor premorbid adjustment, age, race, socioeconomic class, education, hospitalization, electric shock therapy (EST), and organicity. However, to this author's knowledge no experiment has ever fulfilled these requirements. In fact, after studying five issues of leading journals (such as the Journal of Abnormal Psychology), Mednick and McNeil (1968) reported that 63 per cent of the 115 empirical studies which compared schizophrenics with schizophrenics or schizophrenics with normals, did not provide information about the length of hospitalization of their Ss. Furthermore, of the 37 per cent of these studies which reported differences in hospitalization, most of the authors attributed their findings exclusively to diagnostic group differences, despite the

existence of great differences in the length of hospitalization between their patient groups.

There are probably more conflicting findings in the area of schizophrenic research than in almost any other area of psychology. Certainly part of this problem is caused by poor research tactics on the part of experimenters. However, in all fairness, it should be noted that it is very difficult to obtain matched subject-populations. Wynne (1963) gives testimony to this difficulty. He initially hoped to match groups of normals and schizophrenics on many of the above listed variables. His search for patients took him through two large New York hospitals, with approximately 6,900 total beds; however, he performed his experiment with Ss less well suited to his needs. This is what happened to the present author when he attempted to match the patient groups on hospitalization.

Moreover, psychiatric diagnostic categories are very broad. Therefore, within the diagnosis of schizophrenia, Ss vary greatly in their performances on learning tasks. The process-reactive dichotomy is an empirical method that attempted to diminish some of the within group variation; however, the results with this procedure have not been too encouraging. Thus, more rigorous and systematic attempts in this direction are needed.

After examining some of the above problems Mednick and McNeil (1968) conclude that: "Schizophrenics may be too 'contaminated' by the consequences of their illness to be suitable subjects for research on the etiology of schizophrenia" (p. 687). Whether or not one must abandon the study of already schizophrenic patients, as Mednick and

McNeil (1968) have suggested, is a problem for future clarification. However, if one does research with schizophrenic Ss it seems reasonable to expect that the E control for IQ, EST, hospitalization, remitted or nonremitted condition, organicity and drugs.

These problems have also limited the generality of this experiment. Thus, although it appears that the organizational process(es) of some schizophrenics are disturbed, further empirical support for this position is needed. In addition, these process(es) must be pinpointed. The structure-process distinction may provide the framework for future development in this area. However, before its potential can be actualized, further methodological advances are needed. Until this is accomplished, the following comments by Garmezy (1964) seem appropriate:

> But the reader of this literature is left with the distinctly unsettling feeling that soft empirical data are scarcely the foundation stones for hard theorizing about schizophrenic processes. The need for stable, replicable data in the areas of learning and motivation still remains a cardinal need in developing satisfactory formulations of the acquisition of psychopathological processes in schizophrenia (p. 650).

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APPENDIX

Word Association Test

I want to see now quickly you can think of words. I am going to show you some words one at a time, and I want you to give me all the words that come to mind when you see the stimulus word. For example, if I presented you with the word 'eagle' what would you say? (The card containing the word EAGLE was placed on the stand, and prompting was employed if the S did not respond. Then a second example word BLUEBIRD was presented.) Remember, you will have one minute to think of as many words as you can, while I time you with this stop watch. Are there any questions?

Free Recall Test

I am going to present you with several words, and I want you to pronounce each one and try and remember it. After all the words have been presented I will ask you to count backwards from 200 for a brief period of time, after which I will ask you to tell me all the words you can recall. The order in which the words appear is not important, but I want you to see how many words you can remember. Now just for practice let us try a few words: CROW, ROBIN, WING, FLY, LARK, SPARROW, HAWK, DUCK (two trials of the practice list were given). Are there any questions? Remember to pronounce each word, and the order of the words is not important. We will go through this list of words several times, so do not worry if you fail to remember all of the words.

(After the last trial on the first presented-list, the following statement was read): There will now be a short break, after which you will be required to learn some new words.

(After a two-minute break the following statement was read): It is now time to learn the new words. The instructions for this task remain the same. That is, you are to pronounce each word and try to remember it. Also, the order in which you recall the words is not important. We will go through the list several times, so do not worry if you fail to remember all the words.